

FACTORS EFFECTING EXPOSURE TO SECOND-HAND SMOKE IN INDIA WITH SPECIAL FOCUS ON THE ROLE OF KNOWLEDGE OF HEALTH HAZARD OF TOBACCO

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ABSTRACT

This article investigates the role of different factors associated with second-hand smoke among non-smoker adults age 15 and above in India with special focus on the knowledge of tobacco health hazard. To meet the objectives of the study, nationally representative data of Global Adult Tobacco survey conducted in 2009-10 has been used. The findings indicate that the females are more likely to be exposed to SHS at home and less likely at work place. The higher education and urban residence are significant predictors of exposure to SHS at home and work place at $p < 0.001$. The negative average treatment effect using propensity scores method shows that the knowledge of second-hand smoke results in lesser exposure among adult non-smokers at home (ATE=-1.9) and workplace (ATE=-2.3). The knowledge of smoking harmful effects also results in negative treatment effect on exposure to SHS at workplace (ATE=-6.5) among non-smokers in India.

KEYWORDS: Exposure to Second-Hand Smoke, Home, Knowledge, Treatment Effect, Work Place

INTRODUCTION

Second-hand tobacco smoke (SHS) is formed from the burning of smoking products and the smoke exhaled by the smokers.¹ Tobacco smoke contains thousands of chemicals that are released during burning as gases, vapours and particles. Of over 7000 chemicals and compounds that it contains, hundreds are toxic and at least 70 contains well-known cancer causing agents.² Worldwide, large proportion of children, male and female's non-smokers are exposed to the second-hand smoke at home. Second-hand tobacco smoke exposure is linked to a number of adverse health outcomes. Exposure to second-hand smoke resulted in occurrence and deaths from several diseases like ischemic heart disease, lower respiratory infections, asthma, and lung cancer.^{2,3} Second-smoke exposure is affecting every person irrespective of their age. With the growing scientific evidences about the hazard of second-hand smoke, many countries have taken action to reduce SHS exposure through legislation and health education, and have achieved significant improvements.⁴

In order to check exposure to second-hand smoke, smoke-free laws are the important. World Health Organization (WHO) Framework Convention for Tobacco Control has incorporated smoke free laws as an effective global tobacco control policy.⁵ India also approved the FCTC, and there has been legal obligations to protect people from exposure to tobacco some at work places and several public places. There is a prohibition on smoking in public places and in India and fine is imposed to the person caught smoking in the public places. Though legislation for the second-hand smoke is there in India, though have a long way to become a smoke free country. According to COTPA, 2003, the ban on smoking in public places prohibits non-smokers from the harmful effects of SHS. The workplace is a major source of SHS exposure for many adults. SHS in the workplace has been linked to an increased risk for heart disease and lung cancer among adult

non-smokers. Separating smokers from non-smokers, cleaning the air, and ventilating the building cannot prevent exposure if people still smoke inside the building. GATS survey in India reported that 26 % of non-smoker exposed to SHS at work place both indoors and outdoors. At the same time, GATS shows that 57% of non-smoker Indian home smoking is allowed inside the home.⁶ Exposure to second-hand smoke (SHS) is known to have serious health problem to the non-smokers. Making smoke-free home is one of the most important things can be done for the health of the family members. Any family member can develop health problems related to SHS. Some of these problems can be serious and even life-threatening. Multi-unit housing where smoking is allowed is a special concern and a subject of research.

In India, the recent survey of Global Youth Tobacco Survey shows that children are at higher risk of exposure to SHS. Half of the students in India are exposed to the second-hand smoke in India. In India GYTS collected information on exposure to SHS among school children aged 13-15 years.⁷ Various researches on tobacco support the fact that tobacco and SHS are linked to serious health problems that could be prevented. When non-smokers are exposed to SHS it is called involuntary smoking or passive smoking. Non-smokers who breathe in SHS take in nicotine and toxic chemicals by the same route as smokers. The more SHS you breathe, the higher level of these harmful chemicals in your body. However, there was a lack of large scale survey data with information on second-hand smoke exposure among adults in India. Recently conducted Global Adult tobacco Survey in 2009-2010 gives us an opportunity to look into exposure to the second-hand smoke and its associated factors.

Objectives

- To study the factors associated with the exposure to the second-hand smoke among adults in India.
- To study the effect of the knowledge of tobacco health hazard on exposure to second-hand smoke exposure among adults.

Data and Methodology

Data for this study is used from the Global Adult Tobacco Survey (GATS) which is the global standard for systematically monitoring adult tobacco use (smoking and smokeless) and tracking key tobacco control indicators. GATS-India is a nationally representative household survey including household population age 15 and above and covering all the 29 states and two Union Territories in India. Multistage sampling procedure was adopted independently in each state and within the state, independently in urban and rural areas to select the sample. A Complete Data for 69,296 respondents is available among which 33,767 and 35,529 were males and females respectively. Survey covers domains like tobacco use (smoking and smokeless tobacco); exposure to second-hand smoke; cessation; the economics of tobacco; exposure to media messages on tobacco use; and knowledge, attitudes and perceptions towards tobacco use.⁶

Exposure to the second-hand smoke at home is estimated for respondents who reported someone smoking inside his/her home (daily, weekly or monthly), in the past 30 days. Exposure to second-hand smoke at work place is estimated for respondents who reported someone smoking at the work place in the past 30 days. The work place includes indoors or both indoors or outdoors areas. National Tobacco Control Programme has been launched several campaigns and awareness programmes for people to enhance the ill effects of tobacco smoking and SHS. The information on the perceptions about the health impact of smoking and second-hand smoke is collected in GATS India survey.

The analysis was performed in order to explore the effect of different factors on exposure to the second-hand smoke. Bivariate analysis is used to study the association of different relevant factors with exposure to SHS at home and

work place. Multivariate logistic regression analysis is done to assess the significant effect of different socio-demographic factors.

We will model exposure to the second-hand smoke Y_i as a logit with explanatory variables X_i .

The equation will be $Y_i = \sum X_i \beta_i + \epsilon_{in}$

Further in this study we made an attempt to estimate the effect of knowledge of smoking and second-hand smoke health hazard to exposure to the second-hand smoke at home and workplace. We would try to respond the question that whether the knowledge leads to avoidance of exposure to SHS. A measure called average treatment effect (ATE) will be utilized.⁸ This effect will basically study the effect of the knowledge of tobacco health hazard on the difference in exposure to second-hand smoke for exposed and unexposed individuals.

To calculate ATE a method called propensity score matching will be used assuming that knowledge of tobacco health hazard is non-random and associated with only observed characteristics of the individual. Matching method uses propensity scores which involves calculating the probability of getting exposed to SHS for a given adult i age 15 and above i ($i = 1 \dots N$) conditional upon her observed characteristics. Estimation of the average treatment effect based on stratification involves calculating the propensity score using a standard logit model.

RESULTS

Table 1 represents the prevalence and bivariate association of exposure to SHS at home and SHS at work place with selected demographic and social characteristics, perception of ill health effect of smoking and SHS. It is quite surprising to found that a higher percentage of non-smokers are exposed to second-hand smoke (SHS) at home as compared to work place among all the age groups. More than 60% of non-smokers in the age group 15-24 are exposed to SHS at home, and 30% are in the work place in the same age group.

The chi-square test shows that age is not significantly associated with exposure to SHS at both the places. However, with an increase in age the percentage of non-smokers exposed to SHS in both home and work place decreases. Mostly elderly spends more time at home, and almost half (48%) of the elderly at age 65 & more are exposed to SHS at home. This expected to have serious health effect on them only because of SHS. GATS data suggest that female non-smokers are predominantly exposed to SHS at home than their male counterparts with 51% and 44% respectively. The bivariate association of exposure at both places with gender is highly significant.

There are a significant urban rural differentials in the level of exposure to SHS at home and work place (At work place χ^2 value=121.09). It seems education has a positive effect on exposure to SHS at home and negative effect at work place. For example, 42% of non-smokers with no formal education are exposed to SHS at home and it increases with increasing in education up to 66%. While more than one-third of uneducated non-smokers are exposed to SHS at work place and only one-fifth are exposed with secondary and above education.

Table 1: Bivariate Association of Exposure to Second-Hand Smoke (SHS) at Home and at Work Place in India with Selected Background Characteristics, 2009-10

Background Characteristics	Non-Smoker	
	SHS at Home	SHS at Work
Overall	48.0	26.1
Age Group		
15-24	61.7	31.1
25-44	56.2	28.3
45-64	51.0	25.7
65+	48.2	28.2
χ^2 value	3.36	3.54
Sex		
Male	43.9	28.1
Female	51.3	18.9
χ^2 value	43.83***	84.67***
Residence		
Rural	53.7	27.8
Urban	34.5	24.3
χ^2 value	2100***	121.09***
Education		
No formal education	58.5	35.5
Less than primary	50.7	33.7
Primary but less than secondary	49.9	30.5
Secondary and above	34.1	20.8
χ^2 value	2500***	370.04***
Knowledge of SHS Danger		
Yes	47.0	25.6
No	52.7	31.6
χ^2 value	159.70***	38.11***
Knowledge of Smoking Danger		
Yes	47.3	25.5
No	54.7	36.6
χ^2 value	54.22***	42.36***

***p<0.01

There is the difference of 4-5% in the level of SHS exposure among the non-smoker who had has knowledge about the danger of ill health effect of SHS and danger of smoking. For example, 25.6% of non-smokers having knowledge of SHS health hazard are exposed to SHS at work place in comparison with the 31.6% of those who do not have such knowledge. The knowledge of health hazard of smoking is significantly associated with exposure to SHS at home and work place (At work place χ^2 value=42.36, at home χ^2 value=54.22).The knowledge of second-hand smoke is also significantly associated with exposure to second-hand smoke at home.

The majority of the population, smokers and non-smokers believe that living and working with a smoker could affect the health of non-smokers, although non-smokers are more likely to have this perception. It is important to make tobacco users aware about the harmful effects of tobacco on their health.

There is a strong association between the awareness of the adverse health effect of smoking and passive smoking and exposure of smoking and SHS at home and work place. It is seen that most of the time people are aware of the danger of smoking and SHS, but they are unable to avoid it. The logistic regression analysis presents in table 2 shows the effect of perception of danger of smoking, SHS and selected characteristics with exposure to SHS at home and at work place.

Model 1 gives the association between exposure of SHS at home and SHS at work place with selected background characteristics of the non-smokers. Decrease in the odds across all age groups imply a strong association of SHS at home and SHS at work place with age. The association of age with SHS at home is significant while this association with the work place is not much significant. Increase in education is significantly associated with the lesser exposure to SHS at home and work place. Female is 18 percent significantly ($p < 0.001$) more likely to be exposed to SHS at home while in the work place females are 29 percent significantly ($p < 0.001$) less likely to be exposed to SHS.

The urban non-smokers are significantly ($p < 0.001$) less likely to be exposed to SHS as compared to their rural counterparts. Model 2 shows the relationship of perception of danger of SHS and tobacco smoking with SHS at home and SHS at work place. The non-smoker who knows the danger of SHS are 18% significantly ($p < 0.001$) and 19% significantly ($p < 0.01$) less likely to be exposed to SHS at home and work place.

Third model incorporates all the demographic and social characteristics with the knowledge associated variables to see whether after controlling the other factors knowledge level still plays a significant role in exposure to SHS at home and work place. The other factors like age, gender, residence and education still remain significantly associated with exposure to SHS at home and workplace. The third model in both the dependent variables shows that the relationship of the knowledge level variables is slightly inconsistent with exposure to SHS. In order to check this inconsistent relationship we further made an attempt to tackle this issue in more comprehensive statistical manner., The method called propensity score matching is used to estimate the actual impact of knowledge level variables on exposure to SHS at home and work place utilising the method called pscore method. The average treatment effect has been estimated adjusting the other explanatory variables. The negative average treatment effect of knowledge of second-hand smoke health hazard (-1.9) shows the significant role of knowledge towards exposure to SHS at home. Knowledge of second-hand smoke health hazard (-2.3) and smoking health hazard (-6.5) negatively effects the exposure to SHS at the work place. This analysis shows that knowledge of second-hand smoke and smoking helps in reducing the exposure to second-hand smoke at home and work place. The adults who had knowledge of tobacco health hazard at these locations had lesser exposure to second-hand smoke.

CONCLUSIONS

This study investigates the factors associated with exposure to SHS in India. The study also tries to highlights the role of knowledge of the respondents with exposure level to SHS in India. Since the enactment of COTPA act in 2003 in India, there is a prohibition in smoking in public places and prescribes physical segregation of smoking and non-smoking area⁶ still a large proportion of non-smokers are exposed to SHS at work place in India. The situation is more critical among the younger age adults and the males in India. This study has also found that females are significantly more likely to be exposed to second-hand smoke in the home. This finding is consistent with the finding from

Table 2: Logistic Regression of SHS at Home and SHS at Work Place among Adults Age 15 and Above to Exposure to SHS at Home and Work Place

Background Characteristics	SHS at Home			SHS at Work Place		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Sex						
Male®	1.00		1.00	1.00		1.00
Female	1.180***		1.177***	0.713***		0.717***
Residence						
Rural®	1.00		1.00	1.00		1.00

Table 2: Contd.,

Urban	0.588***		0.587***	0.778***		0.781***
Age Group						
15-24@	1.00		1.00	1.00		1.00
25-44	0.796***		0.794***	0.962		0.960
45-64	0.591***		0.589***	0.851*		0.855**
65+	0.505***		0.504***	0.813		0.810*
Education						
No formal education@	1.00		1.00	1.00		1.00
Less than primary	0.852***		0.843***	1.031		1.037
Primary but less than secondary	0.723***		0.713***	0.801***		0.816***
Secondary and above	0.418***		0.411***	0.495***		0.505***
Knowledge of SHS danger		0.817***	0.998		0.809*	0.937
Knowledge of Smoking danger		0.953	1.123**		0.746***	0.864
R ²	0.061	0.001	0.061	0.024	0.001	0.024

Note: @ Reference, *** p <0.01; **p<0.05; * p<0.1

Other studies which says that women are at higher risk of exposure to second smoke. Higher smoking prevalence among men is often linked to higher levels of second-hand smoke exposure among non-smoking women and children living in the smoker's household.⁹ Though the awareness level of SHS health hazard is substantial among female non-smokers in India still there knowledge has not resulted in avoidance of exposure to SHS. The working women in India are significantly less likely to be exposed to SHS as compared to working males in India. With the increase in education, the non-smokers are less likely to be exposed to SHS. Other studies also confirmed that the working status of the person and education are significant predictors of exposure to second-hand smoke.¹⁰

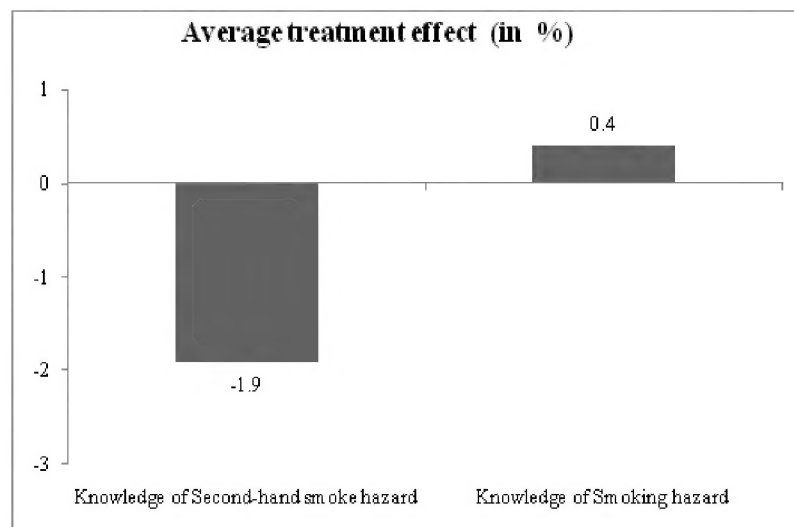


Figure 1: Average Treatment Effect of Knowledge to Exposure to SHS at Home among Non-Smoker Adults in India, 2009-10

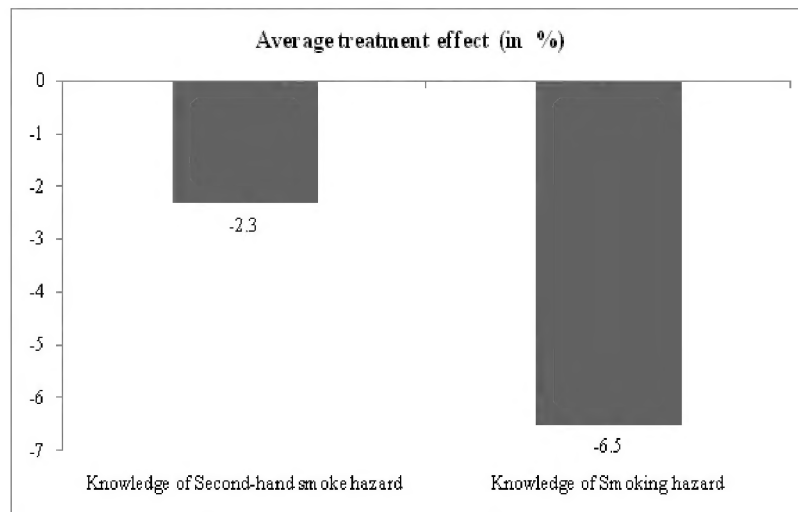


Figure 2: Average Treatment Effect of Knowledge to Exposure to SHS at Home among Non-Smoker Adults in India, 2009-10

Knowledge of the danger of SHS among non-smokers is associated with the lesser exposure to SHS at home and workplace. Similarly, the knowledge of smoking is negatively associated with exposure to SHS at work place. Knowledge level had a significant effect on tolerance behaviour towards second-hand smoke exposure.¹¹ The propensity score method shows that the knowledge of SHS harmful effects resulted in lesser exposure to SHS at home and work place among non-smokers in India. This finding is an example of knowledge turning into behaviour of the person. Similarly, the treatment effect of knowledge of harmful effect of smoking is negative with exposure to SHS at workplace. The knowledge of tobacco health hazard is found to be significantly related to their avoidance behaviour. Higher the knowledge of smoking hazard lesser is the chance to get exposed to the second-hand smoke.^{12,13} Though knowledge of tobacco health hazard is known to the substantial amount of people however, there has been some gap in the appropriate knowledge for the tobacco health hazard.¹⁴

From the policy point of view, smoke-free environments protect the health of non-smokers and helps in reducing smoking. There should be the provision to promote smoke free homes in campaigns prepared for smoke free legislation and aware the people of health hazard of smoking to women and children. The messages should be promoted especially to smokers for the impact they make to the other family members in their home. There is always a need to implement appropriate educational strategies to aware the people about the harmful effects of tobacco in order to reduce the second-hand smoke exposure in the home. There is also a need to promote comprehensive knowledge of tobacco health hazard to every subsection of the society. The knowledge and education of harmful effects of any health hazard is associated with lesser exposure to risk behaviour. There is an urgent need for a smoke-free policy at home, not only in the work or public place as segregating the smoking and non- smoking areas may not facilitate in reducing further SHS exposure among non-smokers. Tobacco prevention/intervention and cessation programs for Indians should emphasize the adverse health effects of second-hand smoke and promote a smoke-free environment.

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